

REMARKS

By this amendment, claims 1, 7 and 8 have been amended and claims 9-16 have been newly added. Accordingly, claims 1-16 are currently pending in the application, of which claims 1, 7, 8, 9, 12 and 15 are independent claims.

Applicants appreciate the indication that claims 7 and 8 are allowed and claims 2-6 contain allowable subject matter.

In view of the above amendments and the following Remarks, Applicants respectfully request reconsideration and timely withdrawal of the pending objections and rejections for the reasons discussed below.

Rejections Under 35 U.S.C. §103

Claim 1 stands rejected under 35 U.S.C. §103(a) as being unpatentable over U. S. Patent No. 6,573,965 issued to Liu, *et al.* (“Liu”) in view of U. S. Patent No. 6,473,149 issued to Melnik, *et al.* (“Melnik”). Applicants respectfully traverse this rejection for at least the following reasons.

Claim 1 recites “the spacers are positioned at ends of the second aperture pattern”. An example of this claimed feature is shown in Fig. 2 of the present application, in which the spacers 100 are “Provided at the end of the element 211, 213, 215, 22, 232 and 233 of the apertures of the common electrode 23” (Specification, page 10, lines 3-4).

The Specification further describes “With this configuration, directors of the liquid crystal molecules at ends of the elements 211, 213, 215, 22, 232 and 233 of the apertures are not aligned in various directions preventing disclination. That is, when a drive voltage is applied to the pixel electrode 12 and the common electrode 23 to control the liquid crystal molecules, the

electric field at ends of the elements 211, 213, 215, 22, 232 and 233 is not uniformly formed and a slanting of the electric field significantly varies. This causes the non-uniform alignment of the liquid crystal molecules. By providing the organic spacers 100 at these locations, disclination is prevented” (Page 10, lines 5-15).

Thus, the claimed feature that “the spacers are positioned at ends of the second aperture pattern” is not a meaningless recitation with no purposes. Rather, this claimed feature prevents disclination at the end of the second aperture pattern.

In this regard, the Examiner admitted “Liu does not explicitly disclose spacers positioned at ends of the second aperture pattern” (Office Action, page 3). Regarding this missing feature, the Examiner asserted “Melnik teaches spacer locations as a result effective variable to prevent disclination in the inter pixel region. Please note that in considering disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom” (Office Action, page 3).

From the above statement, Applicants believe that the Examiner admits that Melnik does not explicitly disclose “the spacers are positioned at ends of the second aperture pattern”. It appears that the Examiner believes this claimed feature can be readily derivable from Melnik. Applicants respectfully disagrees.

First, it is submitted that the Examiner’s reasoning for rejection is based on inaccurate understanding of Melnik. Melnik is directed to prevent reverse tilt disclination in *the pixel region*, not in the interpixel region. The interpixel region is a gap between two pixel regions which is usually blocked by black matrix.

As clearly shown in Fig. 4, the reverse tilt disclination occurs the most in the reverse tilt disclination region, not in the interpixel region. The reverse tilt disclination causes a greater problem if it occurs in the pixel region where light is transmitted. As Melnik describes "This disclination results in an unwanted transmission of light. The transmission of light results in a spurious bright line across a portion of an otherwise darkened pixel" (Column 3, lines 22-25).

Nevertheless, the Examiner asserted that "Melnik teaches spacer location as a result effective variable to prevent disclination in the *inter-pixel region*" (Office Action, page 3). As explained above, since the spacers 110' are not formed to prevent disclination in the *inter-pixel region*, it is submitted that the Examiner's reasoning for the rejection is based on inaccurate understanding of Melnik.

Second, Melnik does not disclose or even remotely suggest why spacers should be positioned at the end of the aperture patterns, as claimed.

To solve the prior art problem (i.e., reverse tilt disclination in a pixel region), Melnik discloses forming a spacer 110' "in the interpixel region (between electrodes 112a, 112b)" (Column 4, lines 28-29). Melnik further describes:

"In order for the spacer 110' to prevent formation of the bend deformation in the interpixel region, *it must extend the length of the border region between adjacent pixels*. Thus, as shown in FIG. 5a, the "spacers" are actually ribs, when viewed from above the LCD. FIG. 5a shows only ribs extending in one direction, between columns of pixels. *This will suppress the formation of reverse tilt disclination when adjacent pixels in the same row* (such as pixels corresponding to electrodes 112a, 112b) are in the inversion mode. To prevent a reverse tilt disclination when adjacent pixels in the same column are in inversion mode, both the rows and columns would have to have the ribs. (In other words, each pixel would be completely surrounded with the spacer material, as shown in FIG. 5b.)"

Melnik merely describes “it *must* extend the length of the border region between adjacent pixels” but does not recognize importance of the relationship between an aperture pattern formed on an electrode and the spacers. There is no implication from Melnik that can interrelate the locations of the spacers and an aperture pattern. For this reason, it is submitted that one skilled in the art would not have reasonably expected the claimed invention since there is no interference as to the relationship between an aperture pattern formed on an electrode and the spacers

Third, the Examiner asserted “optimization of a result effective variable requires only routine skilled in the art” and “Melnik is evidence that those of ordinary skilled ... would have found the reason, suggestion, and motivation to use spacers in the disclination regions optimized to locations at ends of spacer aperture patterns to prevent reverse tilt disclination: (Office Action, page 3). This assertion is respectfully disagreed with.

As previously mentioned, Melnik does not even remotely suggest the relationship between an aperture pattern and the locations of individual spacers. Also, in Melnik, the spacer 110' extends the length of the border region between adjacent pixels to suppress the formation of reverse tilt disclination when adjacent pixels in the same row. Further, the Examiner fails to explain what is optimizing the locations of the spacer 110' and what kind of differences the asserted optimization makes as compared to the rib style spacer 110's shown in Figs. 5a and 5b of the Melnik.

For these reasons, it is submitted that the claimed invention would not be achieved by mere optimization from the cited references and one in ordinary skill would not have found the reason, suggestion and motivation to form the spacers at the ends of the aperture patterns of an electrode.

Accordingly, it is submitted that claim 1 is patentable over the cited references, and Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claim 1.

New Claims

In this response, claims 9-16 have been newly added to claim the invention from different perspectives. Support for these new claims can be found in page 13, lines 17-23 of the specification, which recites:

“although aperture patterns are formed in the common electrode and the pixel electrodes in the above embodiments, it is possible to form both an aperture pattern and protrusion only in the pixel electrode. In this case, the protrusion can be formed, for example, out of the gate insulating layer or the protection layer. ... As another example, an aperture pattern may be formed in the pixel electrodes and protrusions in the common electrode”

Independent claims 9, 12 and 15 recite “the second protrusion pattern is positioned at ends of the first protrusion pattern”, “the second protrusion pattern is positioned between two ends of the first protrusion pattern” and “the second protrusion pattern is positioned between two of the plurality of straight line patterns”, respectively. As previously mentioned, the combination of the cited references does not disclose or suggest these claimed features. Thus, it is submitted that claims 9-16 are patentable over the applied references.

Other Matters

In this response, claims 1, 7 and 8 have been amended for clarification/correction purposed only. For example, the term “alternatingly” has been replaced with --alternately-- since

was not found in a dictionary. Also, the recitation “pixel electrodes” has been replaced with --a pixel electrode-- to clarify the claimed features.


CONCLUSION

Applicants believe that a full and complete response has been made to the pending Office Action and respectfully submit that all of the stated grounds for rejection have been overcome or rendered moot. Accordingly, Applicants respectfully submit that all pending claims are allowable and that the application is in condition for allowance.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact the Applicant's undersigned representative at the number below to expedite prosecution.

Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,



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